Theodore M. Flynn, Ph. D. *Curriculum Vitae*

CONTACT

1801 S. Michigan Ave.
Chicago, IL 60616 USA

Phone: (312) 291-1854
Email: tflynn@anl.gov

EDUCATION

University of Illinois — Urbana, IL
Ph. D. in Geomicrobiology, 2011

Marine Biological Laboratory — Woods Hole, MA
Microbial Diversity course, 2008

University of Notre Dame — Notre Dame, IN
B. Sc. in Environmental Geoscience, 2004

University of Western Australia — Perth, WA, Australia
Study abroad program, 2002

PROFESSIONAL EMPLOYMENT

Argonne National Laboratory — Argonne, IL
Assistant Microbial Ecologist, Biosciences Division — Aug. 2015 – current
Joint Research Staff, Biosciences Division — Sep. 2013 – Aug. 2015
Director's Postdoctoral Fellow, Biosciences Division — Sep. 2011 – Sep. 2013

The University of Chicago — Chicago, IL
Research Scientist, Computation Institute — Sep. 2013 – Aug. 2015

United States Environmental Protection Agency — Urbana, IL
Research Consultant, National Risk Management Research Laboratory — Jul. 2010 – Aug. 2011

University of Illinois at Urbana-Champaign — Urbana, IL
Graduate Research Assistant, Department of Geology — Aug. 2004 – Dec. 2010

University of Notre Dame — Notre Dame, IN
Undergraduate Research Assistant — Fall 2001 – Fall 2003

RESEARCH EXPERIENCE

Argonne National Laboratory

- Collaborate with x-ray physicists, soil scientists, and engineers to characterize the molecular and microbiological mechanisms that control the mobility of metals and carbon in the subsurface
- Investigate the geochemical and ecological mechanisms that control microbial community function using functional and phylogenetic tools to better understand carbon and nutrient cycling in soil
- Assemble genomes de novo from metagenomic shotgun sequence data to create metabolic profiles of uncultivated microorganisms
- Create thermodynamic models to predict the distribution of metabolic groups in the subsurface of uranium in a contaminated aquifer

The University of Chicago

- Develop a combined flow cytometry and metagenomic approach that shed new light on the role of the microbiome on regulating immunoglobulin A secretion in the human and murine gut
- Assist bioinformaticians in the development of novel software tools that improved the speed and accuracy of genome assembly and annotation

United States Environmental Protection Agency

- Integrate geochemical measurements with microbiological community profiles using multivariate statistics to better understand geochemical processes in a regional aquifer and their relation to carbon sequestration

University of Illinois at Urbana-Champaign

- Plan and execute the sampling, characterization, and analysis of coupled microbiological and geochemical processes in a pristine regional aquifer
- Test Geochemist's Workbench® modeling software to identify bugs prior to a major release
- Mentor undergraduate student researchers and junior graduate students

Computational Skills

- Molecular microbial ecology and statistical analysis of 16S rRNA gene sequence data (QIIME, R, ggplot2, phyloseq, ARB, mothur, Primer-6)
- Metagenomic analysis and assembly of whole-genome shotgun sequence data (MG-RAST, SPAdes, RAST, Kbase)
- Geochemical and reactive transport modeling (The Geochemist's Workbench®)
- Graphic design (Adobe Illustrator and Photoshop, LaTeX)

Ongoing Collaborations

- Impact of the gut microbiome on T cell-dependent IgA antibody response in murine and human systems (P.I.: Prof. Albert Bendelac, Department of Pathology, The University of Chicago).
- Microbial contributions to methane oxidation in diverse sedimentary environments (P.I.: Dr. Edward O'Loughlin, Argonne National Laboratory).
- Behavior of antimony(V) under iron- and sulfate-reducing conditions (P.I.: Dr. Edward O'Loughlin, Argonne National Laboratory).
- Impact of nitrogen and phosphorus availability on microbial community composition and greenhouse gas emission in a tropical lowland rainforest (co-P.I.s: Dr. Silvia Alvarez-Clare, Argonne National Laboratory, Prof. Corey Cleveland, University of Montana)
- Impact of commercial natural gas production on the interaction between sulfate reducers and methanogens in the Cherokee Basin, Kansas (P.I.: Prof. Matthew Kirk, Kansas State University)

Publications (h-index = 8)

Published/In Press

Bunker JJ, **Flynn TM**, Koval JC, Shaw DG, Meisel M, McDonald BD, Ishizuka IE, Dent AL, Wilson PC, Jabri B, Antonopoulos DA, and Bendelac A (2015) "Innate and adaptive humoral responses coat distinct commensal bacteria with Immunoglobulin A," *Immunity* Vol. 43(3) p. 541–553.

Flynn TM, O'Loughlin EJ, Mishra B, DiChristina TJ, Kemner KM (2014) "Sulfur-mediated electron shuttling during bacterial iron reduction," *Science*, Vol. 344(6187) p. 1039–1042.

Dong Y, Kumar CG, Chia N, Kim P-J, Miller PA, Price ND, Cann IKO, **Flynn TM**, Sanford RA, Krapac IG, Locke RA, Hong P-Y, Tamaki H, Liu W-T, Hernandez AG, Wright CL, Mikel MA, Walker JL, Sivaguru M, Fried G, Yannarell AC, Mackie RI, Fouke BW (2014) "*Halomonas sulfidaeris*-dominated microbial communities inhabits a 1.8 km-deep subsurface Cambrian sandstone reservoir," *Environmental Microbiology*, Vol. 16(6), p. 1695–1708.

Flynn TM, Sanford RA, Ryu H, Bethke CM, Levine AD, Ashbolt NJ, Santo Domingo JW (2013) "Functional microbial diversity and substrate utilization explain groundwater chemistry in a pristine aquifer," *BMC Microbiology*, Vol. 13(1), p. 146(1–15).

O'Loughlin EJ, Boyanov MI, **Flynn TM**, Gorski CA, Hofmann SM, McCormick ML, Scherer MM, Kemner KM (2013) "Effects of bound phosphate on the bioreduction of lepidocrocite (γ-FeOOH) and maghemite (γ-Fe_2O_3) and the formation of secondary minerals," *Environmental Science & Technology*, Vol. 47(16), p. 9157–9166.

Flynn TM, Sanford RA, Bethke CM, Iker B, Levine AD, Ashbolt NJ, Santo Domingo JW (2012) "The active bacterial community in a pristine, confined aquifer," *Water Resources Research*, Vol. 48, p. W09510.

Bethke CM, Sanford RA, Kirk MF, Jin Q, **Flynn TM** (2011) "The thermodynamic ladder in geomicrobiology," *American Journal of Science*, Vol. 311(3), p. 183–210.

Sanford RA, **Flynn TM**, Holm TR, Kelly WR (2009) "Fate of arsenic in the Mahomet Aquifer: The influence of added sulfate and nitrate," *Midwest Technology Assistance Center Pub. TR08–06.*

Flynn TM, Sanford RA, Bethke CM (2008) "Attached and suspended microbial communities in a pristine confined aquifer," *Water Resources Research* Vol. 44, p. W07425.

Locock AJ, Burns PC, **Flynn TM** (2005) "The role of water in the structures of synthetic hallimondite, $Pb_2[(UO_2)(AsO_4)_2](H_2O)_n$ and synthetic parsonsite, $Pb_2[(UO_2)(PO_4)_2](H_2O)_n$, $0 \leq n \leq 0.5$," *American Mineralogist*, Vol. 90(1), p. 240–246.

Locock AJ, Burns PC, **Flynn TM** (2005) "Structures of strontium- and barium-dominant compounds that contain the autunite-type sheet," *Canadian Mineralogist*, Vol. 43, p. 721–733.

Locock AJ, Burns PC, Duke MJM, **Flynn TM** (2004) "Monovalent cations in structures of the meta-autunite group," *Canadian Mineralogist*, Vol. 42, p. 973–996.

Locock AJ, Burns PC, **Flynn TM** (2004) "Divalent transition metals and magnesium in structures that contain the autunite-type sheet," *Canadian Mineralogist*, Vol. 42, p. 1699–1718.

Publications Under Review

Kirk MF, Wilson BH, Marquart KA, Zeglin LH, Vinson DS, **Flynn TM** "Solute concentrations influence microbial methanogenesis in coal-bearing strata of the Cherokee basin, USA," *Frontiers in Microbiology*

Houghton JL, Foustoukos D, Bradley AS, **Flynn TM**, Vetriani C, Fike DA "Thiosulfate oxidation in *Thiomicrospira thermophila*: metabolic flexibility in response to ambient geochemistry," *Environmental Microbiology.*

Dong Y, Sanford RA, Boyanov MI, Kemner KM, **Flynn TM**, O'Loughlin EJ, Cann IKO, Mackie RM, Locke RA, Weber JR, Egan SM, Fouke BW "Isolation and characterization indigenous iron-reducing Firmicutes bacteria inhabiting the 1.7–2.0 km deep Cambrian-age Mt. Simon sandsone, Illinois Basin, USA," *Applied and Environmental Microbiology.*

Publications in Preparation

Flynn TM, Koval JC, Kemner KM, Antonopoulos DA "Community level physiological profiling of diverse environments reveals functional and taxonomic diversity within aerobic, single carbon-source enrichments," in preparation for *Applied and Environmental Microbiology.*

Flynn TM, Boyanov MI, Skinner K, Kelly SD, Wu W-M, Criddle CS, Yan F, Marsh TL, Antonopoulos DA, O'Loughlin EJ, Kemner KM "Microbial response to spatial and temporal dynamics of uranium, iron, and sulfur in ethanol-amended sediments" in preparation for *Applied and Environmental Microbiology.*

Boyanov MI, **Flynn TM**, Skinner K, Kelly SD, Wu W-M, Criddle CS, Yan F, Marsh TL, O'Loughlin EJ, Kemner KM "Spatial and temporal dynamics of uranium, iron, sulfur in ethanol-amended sediments from a contaminated field site" in preparation for *Geochimica et Cosmochimica Acta.*

Presentations Given

Invited Talks

Flynn TM (2015) Departmental Colloquium, Department of Geophysical Sciences, The University of Chicago, Chicago, IL

Flynn TM (2015) "Microbial ecology and groundwater geochemistry," Departmental Colloquium, Department of Geology, University of Wisconsin–Eau Claire, Eau Claire, WI.

Flynn TM (2014) "Biogeochemical cycling and microbial ecology in the terrestrial subsurface," Departmental Colloquium, Department of Earth and Planetary Sciences, Northwestern University, Evanston, IL.

Flynn TM (2014) "Microbial ecology and groundwater geochemistry," Departmental Colloquium, Department of Earth and Planetary Sciences, Washington University in St. Louis, St. Louis, MO.

Flynn TM (2014) "Microbial Communities and Groundwater Chemistry in Pristine and Contaminated Environments," Illinois Groundwater Association Fall Meeting, Elgin, IL.

Flynn TM (2014) "Biogeochemical cycling and microbial ecology in subsurface ecosystems" Departmental Colloquium, Department of Earth and Environmental Science, University of Illinois at Chicago, Chicago, IL.

Flynn TM (2014) "Sulfur-mediated electron shuttling during bacterial iron reduction" Department of Energy Office of Biological and Environmental Research, 9^{th} *Annual Subsurface Biogeochemical Research Program PI Meeting*, Washington, DC.

Flynn TM (2013) "Microbial ecology and groundwater geochemistry," Departmental Colloquium, Department of Civil & Environmental Engineering & Earth Sciences, University of Notre Dame, Notre Dame, IN.

Flynn TM (2013) "Microbial diversity and groundwater chemistry in pristine and contaminated aquifers," Earth Science Division Seminar, Lawrence Berkeley National Laboratory, Berkeley, CA.

Flynn TM (2013) "Groundwater chemistry and microbial activity in a pristine aquifer," Geosyntec Consultants, San Francisco, CA.

Flynn TM (2010) "The ecology of iron-reducing and sulfate-reducing bacteria in a pristine, confined aquifer," Biosciences Division Seminar, Argonne National Laboratory, Argonne, IL.

Flynn TM (2010) "The active bacterial community in a pristine, confined aquifer," Challenges in Environmental Molecular Microbiology workshop, Argonne National Laboratory, Argonne, IL.

Conference Presentations (*denotes oral format)

Flynn TM, Koval JC, Greenwald SM, Owens SM, Kemner KM, Antonopoulos DA (2015) "Community level physiological profiling of diverse environments reveals functional and taxonomic diversity within aerobic, single carbon-source enrichments," *American Society for Microbiology* 115^{th} *General Meeting*, New Orleans, LA.

***Flynn TM**, O'Loughlin EJ, Mishra B, DiChristina TJ, Kemner KM (2014) "Sulfur-mediated electron shuttling during bacterial iron reduction," Ninth International Symposium on Subsurface Microbiology, Pacific Grove, CA.

Flynn TM, Moormann SM, Owens SM, O'Brien SL, O'Loughlin EJ, Kemner KM, Antonopoulos DA (2014) "Community level physiological profiling of diverse soil environments reveals functional diversity but taxonomic homogeneity within aerobic, single carbon source enrichments," Ecological

Society of America Annual Meeting, Sacramento, CA.

*__Flynn TM__, Boyanov MI, Skinner K, Kelly SD, Wu W, Criddle CS, Yan F, Marsh TL, O'Loughlin EJ, Kemner KM (2014) "Microbial response to spatial and temporal dynamics of uranium, iron, and sulfur in ethanol-amended sediments," *Geochemical Society* 24^{th} *Goldschmidt Geochemistry Conference*, Sacramento, CA.

*__Flynn TM__, O'Loughlin EJ, Kemner KM (2013) "The preferential reduction of elemental sulfur by metal-reducing bacteria under alkaline conditions," Midwest Geobiology Symposium, Indianapolis, IN.

*__Flynn TM__, O'Loughlin EJ, Kemner KM (2013) "The reduction of elemental sulfur by metal-reducing bacteria under alkaline conditions," *Geochemical Society* 23^{nd} *Goldschmidt Geochemistry Conference*, Florence, Italy.

*__Flynn TM__, O'Loughlin EJ, Kemner KM (2013) "Geochemical explanation for the prevalence of sulfur reduction among nominally iron-reducing bacteria," *American Chemical Society* 245^{th} *National Meeting*, New Orleans, LA.

*__Flynn TM__ (2012) "Microbial diversity in a geochemically-zoned, pristine aquifer," *5th Annual Postdoctoral Research Symposium*, Argonne National Laboratory, Argonne, IL.

*__Flynn TM__, Sanford RA, Santo Domingo JW, Ashbolt NJ, Levine AD, Bethke CM (2012) "Resilience of bacterial communities in a pristine aquifer despite changes in the availability of sulfate," *Geochemical Society* 22^{nd} *Goldschmidt Geochemistry Conference*, Montréal, QC, Canada.

__Flynn TM__, Sanford RA, Bethke CM, Santo Domingo JW, Iker B, Ashbolt NJ, Levine AD (2010) "Variations in the active bacterial community in a pristine confined aquifer," *International Society for Microbial Ecology*, 13^{th} International Symposium on Microbial Ecology, Seattle, WA.

*__Flynn TM__, Sanford RA, Bethke CM (2010) "Groundwater chemistry and the active bacterial community in a pristine confined aquifer," *Geochemical Society Goldschmidt Conference on Earth, Energy, and the Environment*, Knoxville, TN.

*__Flynn TM__, Sanford RA, Bethke CM (2008) "Microbial communities and groundwater chemistry in a pristine confined aquifer," *Geological Society of America* 118^{th} *Annual Meeting*, Houston, TX.

__Flynn TM__, Sanford RA, Wallace PL, Bethke CM (2007) "Comparing the microbial communities obtained by various groundwater sampling techniques," *American Society for Microbiology* 107^{th} *General Meeting*, Toronto, ON, Canada.

*__Flynn TM__, Sanford RA, Wallace PL, Bethke CM (2006) "Groundwater filtrates as samples of the subsurface microbial community," *Geological Society of America* 116^{th} *Annual Meeting*, Philadelphia, PA.

Other Presentations (*denotes oral format)

*Boyanov MI, O'Loughlin EJ, Latta DE, Mishra B, __Flynn TM__, Antonopoulos DA, Kemner KM "Speciation of U(IV) in sediment microcosms and model biogeochemical systems under reducing conditions," *American Chemical Society* 250^{th} *National Meeting*, Boston, MA.

Johnson CR, Antonopoulos DA, Boyanov MI, __Flynn TM__, Kemner KM, Koval JC, O'Loughlin EJ (2015) "Behavior of antimony(V) under Fe(III)- and sulfate-reducing conditions," *American Chemical Society* 249^{th} *National Meeting*, Denver, CO.

*Alvarez-Clare SC, Cleveland CC, O'Loughlin EJ, Sullivan BW, Weintraub SR, **Flynn TM**, Antonopoulos DA (2015) "Influence of nutrient availability on greenhouse gas emissions and microbial community composition in a lowland tropical rainforest," 52^{nd} Annual Meeting of the Association for Tropical Biology and Conservation, Honolulu, HI.

*Kirk MF, Marquart K, Wilson B, **Flynn TM**, Vinson D (2014) "Thermodynamic constraints on interaction between sulfate reducers and methanogens in a coalbed methane reservoir," invited talk, *American Geophysical Union Fall Meeting*, San Francisco, CA.

Alvarez-Clare SC, O'Loughlin EJ, **Flynn TM**, Antonopoulos DA, Cleveland CC, Sandi C (2014) "Influence of nutrient availability on greenhouse gas emissions and microbial community composition in a lowland tropical rainforest," Argonne Soil Metagenomics Meeting, Lemont, IL.

O'Loughlin EJ, **Flynn TM**, Koval JC, Owens SM, Arend K, Antonopoulos DA (2014) "Effects of 2-Chloro-6-Methylpyridine Concentration on Microbial Community Development During Aerobic Methane Oxidation," *American Society for Microbiology* 114^{th} *General Meeting*, Boston, MA.

Antonopoulos DA, **Flynn TM**, Handley KM, Kwon MJ, Bartels D, Boyanov MI, Meyer F, Mishra B, Trimble WL, Long PE, Williams KH, DiChristina TJ, Kemner KM (2014) "Interconnected Cycling of Fe, S, and C in the Terrestrial Subsurface: New Paths and Opportunities for Coupling Biotic and Abiotic Processes," Department of Energy Office of Biological and Environmental Research, 9^{th} *Annual Subsurface Biogeochemical Research Program PI Meeting*, Washington, DC.

O'Loughlin EJ, Kwon MJ, **Flynn TM**, Antonopoulos DA, Boyanov MI, Brulc JM, DiChristina TJ, Johnston E, Long PE, Williams KH, Kemner KM (2013) "Coupled processes in the biogeochemical dynamics of Fe, S, and C under sulfate- and iron-reducing conditions," Department of Energy Office of Biological and Environmental Research, 8^{th} *Annual Subsurface Biogeochemical Research Program PI Meeting*, Washington, DC.

Kemner KM, O'Loughlin EJ, Boyanov MI, Antonopoulos DA, Latta DE, **Flynn TM**, Brooks SC, E. Carpenter, Criddle CS, Fredrickson JK, Löffler FE, Marsh TL, McCormick ML, Mishra B, Sanford RA, Segre C, Scherer MM, Wu W, Zachara JM, Giometti CS (2012) "The Argonne Subsurface Biogeochemical Research Program Scientific Focus Area," Department of Energy Office of Biological and Environmental Research, 7^{th} *Annual Subsurface Biogeochemical Research Program PI Meeting*, Washington, DC.

O'Loughlin EJ, Kwon MJ, Antonopoulos DA, Boyanov MI, Brulc JM, **Flynn TM**, Johnston E, Skinner K, Long PE, Williams KH, McCormick ML, Kemner KM (2012) "Effects of Fe^{III} oxide mineralogy and electron donor on the biogeochemical dynamics of Fe, S, and C under sulfate- and iron-reducing conditions," Department of Energy Office of Biological and Environmental Research, 7^{th} *Annual Subsurface Biogeochemical Research Program PI Meeting*, Washington, DC.

Dong Y, Cann I, Mackie R, Price N, **Flynn TM**, Sanford R, Miller P, Chia N, Kumar CG, Kim P-J, Sivaguru M, Fouke B (2010) "Looking for a needle in the haystack: Deciphering indigenous 1.79 km deep subsurface microbial communities from drilling mud contaminants using 454 pyrotag sequencing," *American Geophysical Union Fall Meeting*, San Francisco, CA.

*Strattan DJ, Sanford RA, **Flynn TM**, Bethke CM (2010) "Gene expression of dissimilatory sulfite reductase in *Desulfovibrio vulgaris* as a marker for the rate of sulfate reduction in natural systems," *Geochemical Society Goldschmidt Conference on Earth, Energy, and the Environment*, Knoxville, TN.

Bethke CM, Sanford RA, **Flynn TM**, Kirk MF (2009) "The thermodynamic ladder in aquifer microbiology," *Geological Society of America* 119^{th} *Annual Meeting*, Portland, OR.

*Strattan DJ, Kyrias MP, Sanford RA, **Flynn TM**, Bethke CM (2008) "In situ sampling method for determining dissolved gas content and major ion composition of groundwater," *Geological Society of America* 118^{th} *Annual Meeting*, Houston, TX.

Bethke CM, Sanford RA, **Flynn TM**, Ding D, Kirk MF, Park J, Jin Q (2007) "Reactive transport analysis of the origin of microbiological and geochemical zoning," Department of Energy Office of Basic Energy Sciences, *Computational and Numerical Geosciences Symposium*, Gaithersburg, MD.

Honors & Awards

- Certificate of Merit, American Chemical Society, Division of Environmental Chemistry, 2013
- *BMC Microbiology* "Highly Accessed Paper" for Flynn et al. (2013)
- Isotech Poster Award, School of Earth, Society and the Environment Annual Research Review, University of Illinois, 2005 (3rd Place), 2009 (2nd Place).
- Phi Kappa Phi honor society (top 10% of graduate students), University of Illinois, elected 2008
- Gutschick Award for Excellence in Undergraduate Research, University of Notre Dame, 2004
- Dean's List, University of Notre Dame, 2002 – 2004

Grants & Fellowships

- Principal investigator, Lab-Directed Research Directives grant ($330k/yr), Argonne National Laboratory, 2015–2018
- Co-investigator, Argonne Subsurface Science SFA ($1.2 million/yr), Department of Energy Office of Biological and Environmental Research, 2016-2018
- Sustaining grant, Midwest Geobiology Symposium, Agouron Institute, 2014
- Director's Postdoctoral Fellowship, Argonne National Laboratory, 2011 – 2013
- Marsha Ring Winslow Research Grant, University of Illinois, 2009
- Daniel S. and Edith T. Grosch Scholarship, Marine Biological Laboratory, 2008
- Frank R. Lillie Scholarship, Marine Biological Laboratory, 2008
- Roscoe Jackson Graduate Research Grant, University of Illinois, 2008
- Conference Travel Grant, University of Illinois Graduate College, 2007, 2008
- Texas-Louisiana Alumni Fellowship, University of Illinois, 2004 – 2005
- National Science Foundation REU Summer Fellowship, 2003

Professional Service

- Editor, *mSystems*, American Society for Microbiology, 2015 – present
- Co-organizer and oral session moderator, 3rd Midwest Geobiology Symposium, Field Museum of Natural History, Chicago, IL
- Doctoral dissertation examiner, Faculty of Cell and Molecular Bioscience, Victoria University of Wellington, New Zealand, 2014
- Ad hoc reviewer for *The ISME Journal*, *Environmental Science & Technology*, *Earth and Planetary Science Letters*, *FEMS Microbiology Letters*, *Geomicrobiology Journal*, *Chemical Geology*, and *Science of the Total Environment* – 2011 to present
- Planning committee, Annual Research Review of the School of Earth, Society, and the Environment, University of Illinois, 2006, 2008 – 2010
- President, Graduate Student Council, Department of Geology, University of Illinois, 2005 – 2006

Teaching & Outreach

- Science fair judge, James Shields Middle School, Chicago, IL, 2014
- Guest speaker, Microbial Ecology class, Eureka College, Eureka, IL, 2013
- Guest scientist, Carleton W. Washburne Middle School, Winnetka, IL, 2013
- Introduce a Girl to Engineering Day, Argonne National Laboratory, 2012 – 2014
- Science Careers in Search of Women, Argonne National Laboratory, 2012 – 2014
- Teaching Assistant for GEOS 232: Historical Geology, Department of Civil & Environmental Engineering & Earth Sciences, University of Notre Dame, 2004
- Freshman peer advisor, First Year of Studies College, University of Notre Dame, 2003 – 2004

Professional Affiliations

American Society for Microbiology • American Geophysical Union • Geochemical Society • Geological Society of America • International Society for Microbial Ecology • American Chemical Society